Gateway Skills
Science-Intensive Occupations



CAREER CONNECTIONS

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MISSOURI DEPARTMENT OF ECONOMIC DEVELOPMENT

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Key Findings

- According to 2000 estimates, there were 53,350 science-intensive jobs in Missouri earning an annual mean wage of $67,254 per job, which is much higher than the state average wage of $30,812 per job.

- Nationally, there were 2.89 million science-intensive jobs earning an annual mean wage of $70,794 per job. Missouri employs 1.85% of this national total at 95.0% of the national mean annual wage, indicating lower labor costs for science-intensive jobs.

- Most science-intensive jobs were in Services (26,030 jobs earning $73,661 per job), Manufacturing (14,000 jobs earning $59,688 per job), Transport and Public Utilities (3,870 jobs earning $64,946 per job), Retail Trade (3,110 jobs earning $67,543 per job) and Public Administration (3,050 jobs earning $57,428 per job).

- In Missouri, science-intensive occupations with the highest employment base were Computer Software Engineers (5,950 jobs at $65,182 per job), Engineering Managers (4,600 jobs at $75,615 per job), Pharmacists (4,600 jobs at $66,836 per job), Computer Systems Engineers (3,700 jobs at $64,743 per job) and Medical Laboratory Technologists (3,460 jobs at $39,026 per job).

- Occupations with the largest percentage of national employment in Missouri were Obstetricians and Gynecologists (5.32% of national employment at 105.41% of national mean wages), Agricultural Engineers (5.07% of national employment at 97.04% of national mean wages), Aerospace Engineers (4.65% of national employment at 81.43% of national mean wages), Higher Education Physics Teachers (3.96% of national employment at 84.35% of national mean wages), Higher Education Chemistry Teachers (3.68% of national employment at 90.20% of national mean wages), Higher Education Engineering Teachers (3.64% of national employment at 100.62% of national mean wages), Higher Education Biological Science Teachers (3.60% of national employment at 71.50% of national mean wages) and Higher Education Agricultural Science Teachers (3.36% of national employment at 90.30% of national mean wages). These occupations can be considered target occupations, since Missouri has a fair share of national employment and state wage rates are at or below the national mean annual wage - indicating lower labor costs, a possible competitive advantage.

- The most important knowledge domain needed for science-intensive occupations were Mathematics, English Language and Chemistry. Although Missouri institutions of higher education are producing more graduates in many of these fields of study than they did 20 years ago, the proportion of these degrees relative of all degrees conferred is declining.

- On average between 1997 and 2001, only 5.07% of Missouri's 10th graders were proficient or advanced in science. These findings indicate that Missouri's K-12 student population is ill prepared for post secondary study in science-related subjects, and ill prepared to enter the workforce immediately after high school into occupations that require science skills.

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I. Overview

As we move into the 21st century, the connection between well paying jobs and skills has never been more apparent. In today's economy, workers with marketable skills are able to be more competitive in the labor market. *Gateway Skills* are those abilities that allow workers to find employment in occupations characterized by job security, advancement opportunities and high wages. In a changing economic and political landscape, informed decision making requires that labor, industry and government consider occupational requirements in a new manner. Using a skill-based perspective provides a tangible way to make well reasoned judgements linking workforce skills to targeted occupations.

The quality of the workforce matters now more than ever. Well trained workers who can produce high quality goods and services at lower costs helps to enhance productivity and competitiveness in state and national economies - which generally leads to higher living standards. In today's globalized economy, workers must be prepared to change the way they perform their jobs in order to capture the benefits from rapidly evolving technology. Education and training are core components in higher productivity, quality and flexibility for the economy. The economy of the 21st century will see the continued decline of high-paying production jobs requiring few skills. The workplace has been reorganized, and more and more jobs now require communication, mathematics, reading and science skills. In essence, the 21st century economy will be dominated by *knowledge workers*.

The terms knowledge work and knowledge worker are only 40 years old. The terms were first coined around 1960 by a Princeton economist, named Fritz Machlup. Knowledge workers are the new capitalists. Knowledge has become the key resource, and the only scarce one. This means that knowledge workers collectively own the means of production through their specialized education and skills. As a group, they are also capitalists in the old sense. Through their stakes in pension funds and mutual funds, they have become majority shareholders and owners of many large businesses in the knowledge economy. Although knowledge workers are highly specialized, they cannot function effectively as individuals. Knowledge workers need access to an organization - a collective that brings together an array of knowledge workers and applies their specializations to a common end-product. Therefore, it is essential that policy makers and economic development officials recruit organizations that employ these skilled knowledge workers.

Although these terms are widely used, there is a dearth of research informing what constitutes a knowledge worker and their presence in the economy. Science is one of the key knowledge bases in today's economy. Therefore, this analysis focuses on those occupations that require a high degree of knowledge in science - a targeted Gateway Skill.

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II. Methods

Science skills refer to the developed capacities that facilitate learning and/or performance within occupations. Occupations were classified as science-intensive if both the importance and level of science skills needed to perform a particular job were two or more standard deviations above the mean science skill level for all occupations. Using data taken from O*NET, importance and level skills were summed and divided by the maximum value. This generated a science skill proficiency score that ranged from 0.0 (low skill proficiency) to 100.0 (high skill proficiency).

$$\text{SKILL-PROFICIENCY}_{\text{occupation}i} = ((IM+LV) / MAX)$$

Where:
IM = Skill Importance Score
LV = Skill Level Score
MAX = Sum of Maximum Values on IM and LV

The data for this analysis comes from two principle sources. Information on occupational skill requirements was taken from a national database called the Occupational Information Network (O*NET), maintained by the U.S. Department of Labor. Occupational employment and wage data for Missouri was taken from Occupational Employment Statistics (OES), maintained by the Missouri Department of Economic Development and the U.S. Department of Labor.

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*Occupational Information Network (O*NET)*

O*NET is a comprehensive database of worker attributes and job characteristics. The database contains information on knowledge, skill and ability requirements for 1,122 occupations. Although it is sometimes difficult to differentiate among knowledge, skill and ability in practice, they are distinct concepts in theory. Knowledge refers to information that has been acquired though formal education, training or specific experiences. Skills refer to developed capacities that facilitate learning or performance. Abilities are defined as underlying characteristics of individuals, which are related to effective or superior performance in a job.

The knowledge and skills measures are used in this analysis. It is important to remember that knowledge and skills in this study do not measure an individual worker's knowledge and skills. Instead, the knowledge and skills are measures of the average level required by the performance of certain functions in that occupation. Consequently, the score for one worker on any knowledge or skill may differ from another worker within the same occupation.

Occupational Employment Statistics (OES)

The Occupational Employment Statistics (OES) program conducts a yearly mail survey designed to produce estimates of employment and wages for specific occupations. The OES program collects data on wage and salary workers in non-farm establishments in order to produce employment and wage estimates for over 700 occupations. Data from self-employed persons are not collected and are not included in the estimates. The OES program produces these occupational estimates by geographic area and by industry. Estimates based on geographic areas are available at the national, state and metropolitan area levels. Occupational employment and wage estimates for over 400 industry classifications are also available.

The Missouri Department of Economic Development conducts the OES survey for the State of Missouri. Each year more than 10,000 employers will be surveyed through random selection based on their industrial classification, size and geographic location. In addition to the statewide data, there are tabulations for each of the state's six metropolitan statistical areas and thirteen Local Workforce Investment Areas.

III. Science-Intensive Occupations Summary

According to 2000 estimates, there were 53,350 science-intensive jobs in Missouri earning an annual mean wage of $67,254 per job, which is much higher than the state average wage of $30,812 per job. On average in Missouri, entry-level wages were $56,036 per job and experienced-level wages were $79,470 per job. In addition, workers in science-intensive occupations accounted for 1.99% of all employment and 4.33% of all wages earned statewide.

Most science-intensive jobs were in Services (26,030 jobs earning $73,661 per job), Manufacturing (14,000 jobs earning $59,688 per job), Transport and Public Utilities (3,870 jobs earning $64,946 per job), Retail Trade (3,110 jobs earning $67,543 per job) and Public Administration (3,050 jobs earning $57,428 per job).

Nationally, there were 2.89 million science-intensive jobs earning an annual mean wage of $70,794 per job. Missouri employs 1.85% of this national total at 95.0% of the national mean annual wage, indicating lower labor costs for science-intensive jobs.

Science-Intensive Occupations - Employment and Wages by Industry in Missouri

Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	750	$38,599	$54,229	$65,458
Mining	80	$34,455	$47,237	$58,560
Construction	560	$50,339	$61,768	$72,414
Manufacturing	14,000	$47,736	$59,688	$71,283
Transportation and Public Utilities	3,870	$54,738	$64,916	$75,185
Wholesale Trade	790	$52,253	$64,696	$77,553
Retail Trade	3,110	$61,206	$67,543	$80,661
Finance, Insurance, and Real Estate	1,080	$50,119	$61,676	$73,519
Services	26,030	$62,062	$73,661	$85,845
Public Administration	3,050	$49,741	$57,428	$65,877
MISSOURI TOTAL	**53,350**	**$56,036**	**$67,254**	**$79,470**
UNITED STATES TOTAL	**2,886,500**	**$55,964**	**$70,794**	**$86,388**

Source: Analysis of Occupational Employment Statistics by MERIC, MO Department of Economic Development.

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In Missouri, science-intensive occupations with the highest employment base were Computer Software Engineers (5,950 jobs at $65,182 per job), Engineering Managers (4,600 jobs at $75,615 per job), Pharmacists (4,600 jobs at $66,836 per job), Computer Systems Engineers (3,700 jobs at $64,743 per job) and Medical Laboratory Technologists (3,460 jobs at $39,026 per job).

Occupations with the largest percentage of national employment in Missouri were Obstetricians and Gynecologists (5.32% of national employment at 105.41% of national mean wages), Agricultural Engineers (5.07% of national employment at 97.04% of national mean wages), Aerospace Engineers (4.65% of national employment at 81.43% of national mean wages), Higher Education Physics Teachers (3.96% of national employment at 84.35% of national mean wages), Higher Education Chemistry Teachers (3.68% of national employment at 90.20% of national mean wages), Higher Education Engineering Teachers (3.64% of national employment at 100.62% of national mean wages), Higher Education Biological Science Teachers (3.60% of national employment at 71.50% of national mean wages) and Higher Education Agricultural Science Teachers (3.36% of national employment at 90.30% of national mean wages). These occupations can be considered target occupations, since Missouri has a fair share of national employment and state wage rates are at or below the national mean annual wage - indicating lower labor costs, a possible competitive advantage.

In the United States, science-intensive occupations with the highest employment base were Computer Software Engineers (374,640 jobs at $70,300 per job), Computer Systems Engineers (264,610 jobs at $70,890 per job), Engineering Managers (242,280 jobs at $85,450 per job), Pharmacists (212,660 jobs at $69,440 per job) and Mechanical Engineers (207,300 jobs at $60,860 per job).

Between 2000 and 2010, the fastest growing science-intensive occupations in the United States are projected to be Computer Software Engineers (100.0% growth with 41,000 annual openings), Computer Systems Engineers (89.7% growth with 31,000 annual openings), Veterinarians (31.8% growth with 3,000 annual openings), Medical Scientists (26.5% growth with 2,000 annual openings), Hydrologists (25.7% growth with less than 1,000 annual openings), Computer Hardware Engineers (24.9% growth with 2,000 annual openings), Environmental Science Technicians (24.5% growth with 2,000 annual openings), Pharmacists (24.3% growth with 12,000 annual openings), Environmental Scientists and Specialists (22.3% growth with 4,000 annual openings) and Higher Education Teachers (23.5% growth with 68,000 annual openings).

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Science-Intensive Occupations - Employment and Wages in Missouri and the United States

Estimated annual average employment and wages for 2000. Entry wages represent the 25th percentile and expert wages represent the 75th percentile.

OCCUPATION	MISSOURI				UNITED STATES			
	AVERAGE EMPL	ENTRY WAGE	MEAN WAGE	EXPERT WAGE	AVERAGE EMPL	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Computer Software Engineers	5,950	$54,788	$65,182	$76,453	374,640	$53,390	$70,300	$85,490
Computer Systems Engineers	3,700	$50,863	$64,743	$77,387	264,610	$54,460	$70,890	$86,520
Engineering Managers	4,600	$60,312	$75,615	$90,611	242,280	$66,420	$85,450	$105,630
Pharmacists	4,600	$60,963	$66,836	$78,275	212,660	$61,860	$69,440	$81,690
Mechanical Engineers	3,070	$44,185	$55,829	$66,852	207,300	$47,600	$60,860	$72,850
Electrical Engineers	2,790	$47,913	$58,979	$70,737	162,400	$51,700	$66,320	$80,600
Medical Laboratory Technologists	3,460	$34,297	$39,026	$43,688	144,530	$34,220	$41,260	$47,460
Family and General Practitioners	2,610	$91,523	$113,680	$145,616	132,620	$88,260	$107,780	$145,600
Electronics Engineers, Except Computer	1,430	$47,496	$58,222	$68,897	123,690	$52,430	$66,490	$79,960
Chemists	1,390	$37,807	$50,833	$63,804	82,320	$37,480	$54,280	$68,240
Health Specialties Teachers, Higher Educ	1,270	$38,596	$51,537	$57,734	78,680	$41,430	$67,140	$87,720
Aerospace Engineers	3,330	$45,449	$56,220	$66,402	71,550	$56,410	$69,040	$82,570
Computer Hardware Engineers	850	$45,826	$61,129	$74,186	63,680	$52,960	$70,100	$86,280
Environmental Scientists and Specialists	730	$31,597	$37,865	$41,951	54,860	$34,570	$48,090	$58,490
Surveyors	530	$28,547	$40,530	$50,173	52,750	$26,480	$39,060	$49,030
Internists, General	1,420	$118,357	$124,386	$145,607	50,450	$111,890	$123,180	$145,600
Surgeons	1,110	$145,605	$143,567	$145,619	48,770	$145,600	$137,400	$145,600
Veterinarians	770	$38,890	$54,537	$65,648	40,270	$47,020	$68,620	$84,220
Natural Sciences Managers	920	$51,810	$70,004	$85,846	38,870	$56,320	$78,850	$100,760
Biological Science Teachers, Higher Educ	1,330	$30,735	$43,941	$53,566	36,910	$39,480	$61,460	$77,370
Medical Scientists, Except Epidemiologists	180	$51,087	$72,681	$87,938	35,570	$41,350	$63,430	$79,610
Chemical Engineers	760	$51,371	$64,177	$75,464	31,530	$53,440	$67,160	$80,840
Engineering Teachers, Higher Educ	980	$49,334	$67,957	$85,710	26,940	$48,420	$67,540	$85,040
Pediatricians, General	420	$103,311	$116,327	$128,594	25,580	$101,890	$117,020	$145,600
Environmental Science Technicians	200	$24,907	$33,361	$41,087	24,630	$26,000	$35,830	$43,950
Materials Engineers	250	$37,699	$53,976	$75,282	24,430	$47,320	$60,420	$72,900
Geologists	160	$32,523	$41,562	$49,330	21,810	$43,320	$62,420	$77,180
Agricultural and Food Scientists	230	$44,763	$57,270	$67,614	21,050	$40,720	$54,680	$66,370
Aerospace Engineering Technicians	340	$38,677	$45,315	$52,550	19,850	$40,220	$49,920	$57,320
Obstetricians and Gynecologists	970	$145,603	$140,675	$145,615	18,240	$141,730	$133,450	$145,600

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Science-Intensive Occupations - Employment and Wages in Missouri and the United States

Estimated annual average employment and wages for 2000. Entry wages represent the 25th percentile and expert wages represent the 75th percentile.

OCCUPATION	MISSOURI				UNITED STATES			
	AVERAGE EMPL	ENTRY WAGE	MEAN WAGE	EXPERT WAGE	AVERAGE EMPL	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Chemistry Teachers, Higher Educ	590	$40,114	$51,008	$61,483	16,020	$40,390	$56,550	$69,580
Microbiologists	240	$35,269	$48,680	$56,062	15,880	$38,110	$53,040	$64,890
Biochemists and Biophysicists	360	$32,388	$52,300	$67,012	13,440	$39,980	$59,070	$74,490
Nuclear Engineers	170	$61,099	$69,029	$80,823	12,610	$67,590	$78,770	$89,310
Physics Teachers, Higher Educ	470	$41,285	$52,919	$65,704	11,880	$43,920	$62,740	$79,870
Zoologists and Wildlife Biologists	220	$35,352	$42,379	$48,886	11,710	$34,180	$45,630	$55,010
Agriculture Sciences Teachers, Higher Educ	360	$40,316	$56,472	$71,528	10,720	$45,550	$62,540	$78,920
Petroleum Engineers	10	$48,603	$57,565	$71,985	10,250	$60,610	$79,910	$100,210
Physicists	80	$64,051	$78,247	$92,535	8,990	$65,820	$82,990	$102,270
Materials Scientists	30	$35,803	$67,954	$93,507	8,660	$44,600	$62,980	$80,720
Atmospheric and Space Scientists	180	$31,623	$51,619	$69,439	7,290	$39,780	$58,270	$72,740
Hydrologists	50	$43,267	$57,058	$68,580	7,240	$43,740	$57,490	$68,500
Mining and Geological Engineers	60	$38,181	$47,819	$55,715	6,690	$47,320	$64,390	$78,720
Nuclear Technicians	40	$31,136	$36,946	$42,599	4,110	$49,240	$61,970	$76,570
Epidemiologists	30	$39,242	$49,247	$55,231	2,480	$38,930	$51,630	$58,570
Agricultural Engineers	110	$46,065	$57,098	$67,277	2,170	$44,220	$58,840	$71,460
Forestry Science Teachers, Higher Educ	0	0	$0	$0	1,980	$43,670	$60,950	$76,320
Astronomers	0	0	$0	$0	910	$48,610	$73,580	$95,970

Source: Analysis of Occupational Employment Statistics by MERIC, MO Department of Economic Development.

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Science-Intensive Occupations - Missouri Percent of National Employment and Wages

Estimated annual average employment and wages for 2000.

OCCUPATION	MO AVG EMPL	US AVG EMPL	MO PCT OF US AVG EMPL	MO MEAN WAGE	US MEAN WAGE	MO PCT OF US MEAN WAGE
Computer Software Engineers	5,950	374,640	1.59	$65,182	$70,300	92.72
Computer Systems Engineers	3,700	264,610	1.40	$64,743	$70,890	91.33
Engineering Managers	4,600	242,280	1.90	$75,615	$85,450	88.49
Pharmacists	4,600	212,660	2.16	$66,836	$69,440	96.25
Mechanical Engineers	3,070	207,300	1.48	$55,829	$60,860	91.73
Electrical Engineers	2,790	162,400	1.72	$58,979	$66,320	88.93
Medical Laboratory Technologists	3,460	144,530	2.39	$39,026	$41,260	94.59
Family and General Practitioners	2,610	132,620	1.97	$113,680	$107,780	105.47
Electronics Engineers, Except Computer	1,430	123,690	1.16	$58,222	$66,490	87.57
Chemists	1,390	82,320	1.69	$50,833	$54,280	93.65
Health Specialties Teachers, Higher Educ	1,270	78,680	1.61	$51,537	$67,140	76.76
Aerospace Engineers	3,330	71,550	4.65	$56,220	$69,040	81.43
Computer Hardware Engineers	850	63,680	1.33	$61,129	$70,100	87.20
Environmental Scientists and Specialists	730	54,860	1.33	$37,865	$48,090	78.74
Surveyors	530	52,750	1.00	$40,530	$39,060	103.76
Internists, General	1,420	50,450	2.81	$124,386	$123,180	100.98
Surgeons	1,110	48,770	2.28	$143,567	$137,400	104.49
Veterinarians	770	40,270	1.91	$54,537	$68,620	79.48
Natural Sciences Managers	920	38,870	2.37	$70,004	$78,850	88.78
Biological Science Teachers, Higher Educ	1,330	36,910	3.60	$43,941	$61,460	71.50
Medical Scientists, Except Epidemiologists	180	35,570	0.51	$72,681	$63,430	114.58
Chemical Engineers	760	31,530	2.41	$64,177	$67,160	95.56
Engineering Teachers, Higher Educ	980	26,940	3.64	$67,957	$67,540	100.62
Pediatricians, General	420	25,580	1.64	$116,327	$117,020	99.41
Environmental Science Technicians	200	24,630	0.81	$33,361	$35,830	93.11
Materials Engineers	250	24,430	1.02	$53,976	$60,420	89.33
Geologists	160	21,810	0.73	$41,562	$62,420	66.58
Agricultural and Food Scientists	230	21,050	1.09	$57,270	$54,680	104.74
Aerospace Engineering Technicians	340	19,850	1.71	$45,315	$49,920	90.78
Obstetricians and Gynecologists	970	18,240	5.32	$140,675	$133,450	105.41

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Science-Intensive Occupations - Missouri Percent of National Employment and Wages

Estimated annual average employment and wages for 2000.

OCCUPATION	MO AVG EMPL	US AVG EMPL	MO PCT OF US AVG EMPL	MO MEAN WAGE	US MEAN WAGE	MO PCT OF US MEAN WAGE
Chemistry Teachers, Higher Educ	590	16,020	3.68	$51,008	$56,550	90.20
Microbiologists	240	15,880	1.51	$48,680	$53,040	91.78
Biochemists and Biophysicists	360	13,440	2.68	$52,300	$59,070	88.54
Nuclear Engineers	170	12,610	1.35	$69,029	$78,770	87.63
Physics Teachers, Higher Educ	470	11,880	3.96	$52,919	$62,740	84.35
Zoologists and Wildlife Biologists	220	11,710	1.88	$42,379	$45,630	92.88
Agriculture Sciences Teachers, Higher Educ	360	10,720	3.36	$56,472	$62,540	90.30
Petroleum Engineers	10	10,250	0.10	$57,565	$79,910	72.04
Physicists	80	8,990	0.89	$78,247	$82,990	94.28
Materials Scientists	30	8,660	0.35	$67,954	$62,980	107.90
Atmospheric and Space Scientists	180	7,290	2.47	$51,619	$58,270	88.59
Hydrologists	50	7,240	0.69	$57,058	$57,490	99.25
Mining and Geological Engineers	60	6,690	0.90	$47,819	$64,390	74.26
Nuclear Technicians	40	4,110	0.97	$36,946	$61,970	59.62
Epidemiologists	30	2,480	1.21	$49,247	$51,630	95.38
Agricultural Engineers	110	2,170	5.07	$57,098	$58,840	97.04
Forestry Science Teachers, Higher Educ	0	1,980	0.00	$0	$60,950	0.00
Astronomers	0	910	0.00	$0	$73,580	0.00

Source: Analysis of Occupational Employment Statistics by MERIC, MO Department of Economic Development.

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Science-Intensive Occupations - National Employment Projections 2000-2010

Estimated annual average employment and wages for 2000 and 2010.

OCCUPATION	EMPL PCT CHG 2000-2010	ANNUAL GROWTH	ANNUAL REPLACEMENTS	ANNUAL TOTAL OPENINGS	EDUCATION AND TRAINING REQUIREMENTS
Computer Software Engineers	100.0	38,000	3,000	41,000	Bachelors degree
Computer Systems Engineers	89.7	28,000	3,000	31,000	Bachelors degree
Engineering Managers	8.0	2,000	5,000	7,000	Degree plus work experience
Pharmacists	24.3	5,000	7,000	12,000	First professional degree
Mechanical Engineers	13.1	3,000	6,000	9,000	Bachelors degree
Electrical Engineers	11.3	2,000	3,000	5,000	Bachelors degree
Medical Laboratory Technologists	17.0	3,000	4,000	6,000	Bachelors degree
Physicians and Surgeons	17.9	11,000	9,000	20,000	First professional degree
Electronics Engineers, Except Computer	10.4	1,000	3,000	4,000	Bachelors degree
Chemists	19.1	2,000	2,000	4,000	Bachelors degree
Aerospace Engineers	13.9	1,000	1,000	2,000	Bachelors degree
Computer Hardware Engineers	24.9	2,000	1,000	2,000	Bachelors degree
Environmental Scientists and Specialists	22.3	1,000	3,000	4,000	Bachelors degree
Surveyors	8.1	1,000	2,000	2,000	Bachelors degree
Veterinarians	31.8	2,000	1,000	3,000	First professional degree
Natural Sciences Managers	7.6	Less than 1,000	1,000	1,000	Degree plus work experience
Chemical Engineers	4.1	Less than 1,000	1,000	1,000	Bachelors degree
Postsecondary Teachers	23.5	32,000	37,000	68,000	Doctors degree
Environmental Science Technicians	24.5	1,000	1,000	2,000	Associates degree
Materials Engineers	5.3	Less than 1,000	1,000	1,000	Bachelors degree
Geologists	18.1	1,000	1,000	1,000	Bachelors degree
Agricultural and Food Scientists	8.8	Less than 1,000	1,000	1,000	Bachelors degree
Aerospace Engineering Technicians	5.6	Less than 1,000	Less than 1,000	Less than 1,000	Associates degree
Biological Scientists	21.0	2,000	3,000	4,000	Doctors degree
Nuclear Engineers	1.8	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Petroleum Engineers	-7.2	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Materials Scientists	19.8	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Atmospheric and Space Scientists	17.1	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Hydrologists	25.7	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Mining and Geological Engineers	-1.3	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree

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PART 2 OF 2

Science-Intensive Occupations - National Employment Projections 2000-2010

Estimated annual average employment and wages for 2000 and 2010.

OCCUPATION	EMPL PCT CHG 2000-2010	ANNUAL GROWTH	ANNUAL REPLACEMENTS	ANNUAL TOTAL OPENINGS	EDUCATION AND TRAINING REQUIREMENTS
Physicists and Astronomers	10.5	Less than 1,000	Less than 1,000	Less than 1,000	Doctors degree
Agricultural Engineers	14.8	Less than 1,000	Less than 1,000	Less than 1,000	Bachelors degree
Medical Scientists	26.5	1,000	1,000	2,000	Doctors degree
Nuclear Technicians	20.7	Less than 1,000	Less than 1,000	Less than 1,000	Associates degree

Source: Bureau of Labor Statistics, U.S. Department of Labor.

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Using data taken from O*NET, skill proficiency scores were calculated by summing the importance and level skills scores for an occupation and dividing by the maximum value. This generated a skill proficiency score that ranged from 0.0 (low proficiency level) to 100.0 (high proficiency level).

Skills refer to the developed capacities that facilitate learning and/or performance within occupations. Occupations with the highest science skill proficiency were Chemical Engineers (2.8886 standard deviations above the mean), Physicists (2.8886 standard deviations above the mean), Biochemists and Biophysicists (2.7989 standard deviations above the mean), Chemists (2.7599 standard deviations above the mean), Aerospace Engineers (2.7599 standard deviations above the mean), Agricultural Engineers (2.6936 standard deviations above the mean), Astronomers (2.6936 standard deviations above the mean), Nuclear Engineers (2.6819 standard deviations above the mean), Higher Education Health Specialties Teachers (2.6274 standard deviations above the mean) and Aerospace Engineering Technicians (2.6040 standard deviations above the mean).

Knowledge domains refer to information that has been acquired through formal education, training or specific experiences. The most important knowledge domain needed for science-intensive occupations were Mathematics (score of 0.61), English Language (score of 0.51) and Chemistry (score of 0.50). Other relevant knowledge domains include Physics (score of 0.47) and Engineering and Technology (score of 0.45).

PART 1 OF 2

Science-Intensive Occupations - Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

OCCUPATION	LISTENING SKILL	MATHEMATICS SKILL	READING SKILL	SCIENCE SKILL	SPEAKING SKILL	WRITING SKILL
Computer Software Engineers	1.1553	2.1833	1.1485	2.2375	1.1870	0.7056
Computer Systems Engineers	1.1553	2.1833	1.1485	2.2375	1.1870	0.7056
Engineering Managers	0.6068	1.4370	1.5412	2.2375	1.3236	1.4079
Pharmacists	0.9209	1.6012	1.4617	2.0426	0.7067	1.1934
Mechanical Engineers	0.2317	2.4122	1.1532	2.0387	0.3754	0.7056
Electrical Engineers	1.0006	2.3027	1.5272	2.1362	0.9965	1.3238
Medical Laboratory Technologists	0.6443	0.3972	1.4196	2.2063	0.9137	1.1598
Family and General Practitioners	1.4694	1.4072	1.9946	2.2921	1.3277	1.2397
Electronics Engineers, Except Computer	0.7193	2.1037	1.5272	2.0582	0.8309	1.4921
Chemists	0.9068	1.4072	1.6207	2.7599	0.9137	1.7444
Health Specialties Teachers, Higher Educ	1.5445	0.6907	2.0835	2.6274	1.4644	2.0346
Aerospace Engineers	1.3100	2.7654	1.7703	2.7599	0.9799	1.8958
Computer Hardware Engineers	1.1553	2.1833	1.1485	2.2375	1.1870	0.7056
Environmental Scientists and Specialists	-0.3309	2.0142	1.5365	2.2375	-0.1918	0.7014
Surveyors	0.7615	2.3475	1.4617	2.2375	0.5659	1.6855
Internists, General	1.4694	1.4072	1.9946	2.2921	1.3277	1.2397
Surgeons	1.3757	0.6111	1.8077	2.2141	0.9965	1.2397
Veterinarians	1.5445	1.0241	2.0087	2.5650	1.5348	1.3364
Natural Sciences Managers	1.2303	1.2679	1.7703	2.2375	1.4644	1.4752
Biological Science Teachers, Higher Educ	1.2303	1.4370	1.8497	2.2375	1.5348	1.6140
Medical Scientists, Except Epidemiologists	1.3100	1.9346	2.0040	2.5611	1.5306	1.9673
Chemical Engineers	0.4520	1.8550	1.8497	2.8886	1.1870	1.1977
Engineering Teachers, Higher Educ	1.3100	2.3475	1.7703	2.3038	1.4644	1.4037
Pediatricians, General	1.4694	1.4072	1.9946	2.2921	1.3277	1.2397
Environmental Science Technicians	0.1567	1.6062	0.9662	2.2921	-0.0800	0.9874
Materials Engineers	1.1881	1.8052	0.9662	2.0582	0.9137	0.7350
Geologists	0.1379	2.1833	1.2280	2.2375	0.4955	1.5467
Agricultural and Food Scientists	0.2153	1.1460	1.1485	2.4324	0.1539	0.8086
Aerospace Engineering Technicians	-0.3122	2.1037	0.6857	2.6040	-0.4112	0.2303
Obstetricians and Gynecologists	1.4694	1.4072	1.9946	2.2921	1.3277	1.2397

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Science-Intensive Occupations - Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

OCCUPATION	LISTENING SKILL	MATHEMATICS SKILL	READING SKILL	SCIENCE SKILL	SPEAKING SKILL	WRITING SKILL
Chemistry Teachers, Higher Educ	1.3897	1.9346	2.0087	2.3662	1.8080	2.1776
Microbiologists	-0.4997	0.8102	1.5272	2.6040	-0.5769	1.7444
Biochemists and Biophysicists	-0.4997	1.6559	1.6207	2.7989	-0.3698	1.4921
Nuclear Engineers	1.0006	2.2032	1.5272	2.6819	0.9965	1.5762
Physics Teachers, Higher Educ	1.4647	1.9346	2.0881	2.5611	1.7376	2.1776
Zoologists and Wildlife Biologists	-0.6873	0.7106	1.5272	2.5260	-0.4112	0.9032
Agriculture Sciences Teachers, Higher Educ	1.2303	1.4370	1.8497	2.2375	1.5348	1.6140
Petroleum Engineers	1.0006	2.2032	1.1532	2.0582	1.0793	1.5762
Physicists	0.6865	2.6809	1.9292	2.8886	1.0503	2.1734
Materials Scientists	-0.0168	1.4370	1.0737	2.5611	0.6321	1.6182
Atmospheric and Space Scientists	0.6818	1.4370	1.4617	2.4324	1.5348	1.1934
Hydrologists	-0.2512	2.2629	1.1485	2.4324	0.0815	1.6855
Mining and Geological Engineers	1.1928	2.3475	1.5786	2.4987	1.1166	1.7234
Nuclear Technicians	0.5317	1.3077	0.5922	2.0192	0.2926	0.6509
Epidemiologists	1.3100	1.9346	2.0040	2.5611	1.5306	1.9673
Agricultural Engineers	1.3100	2.5167	1.4617	2.6936	1.4644	1.4037
Forestry Science Teachers, Higher Educ	1.2303	1.4370	1.8497	2.2375	1.5348	1.6140
Astronomers	-0.7201	2.5167	1.3869	2.6936	-0.1256	0.9874

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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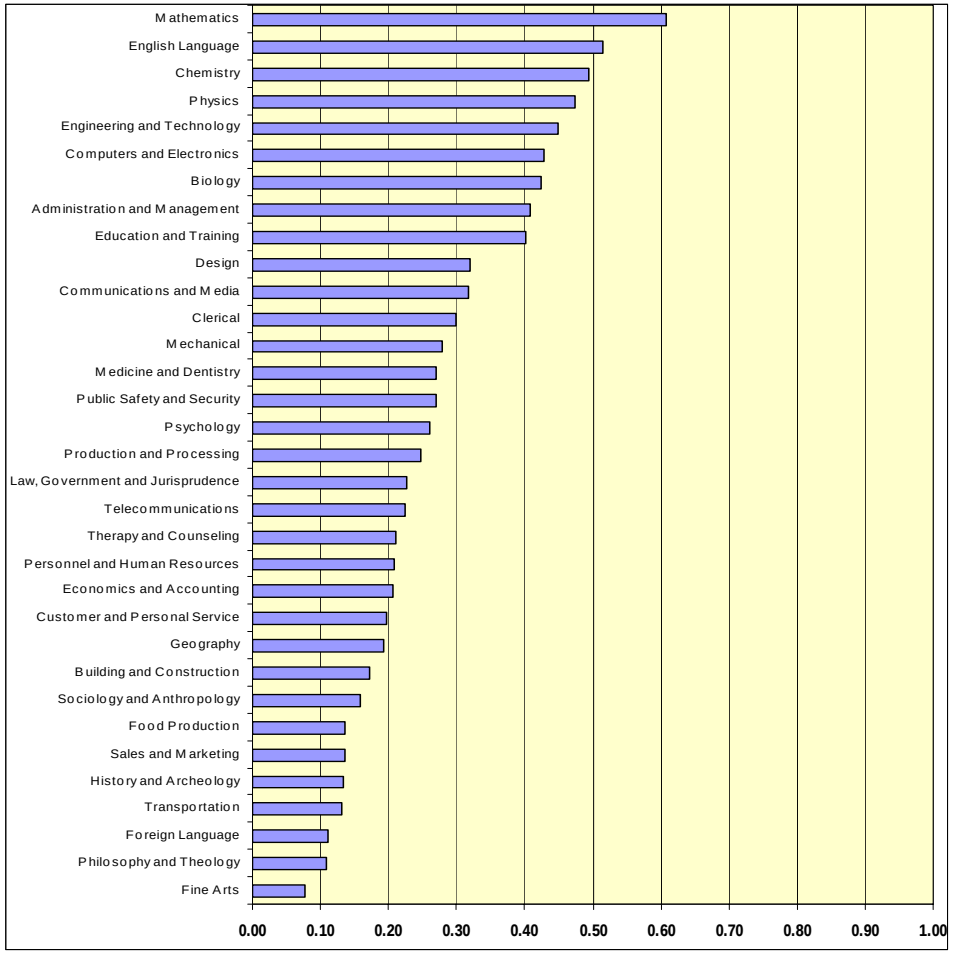
Science-Intensive Occupations - Knowledge Domain Proficiency

Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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In FY 2000, a total of 281 post secondary degrees in mathematics were conferred in Missouri, of which 79.3% were bachelors degrees, 14.3% were masters degrees and 6.4% were doctoral degrees. Although the number of bachelors degrees in mathematics has increased since FY 1981, mathematics degrees as a percent of all bachelors degrees has decreased over the same period. This indicates that proportionately fewer graduates are obtaining bachelors degrees in mathematics in Missouri.

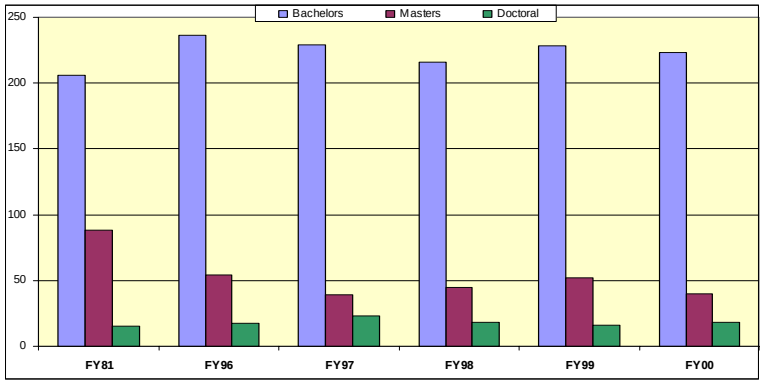
Since FY 1981, the number of masters degrees in mathematics has decreased, as has mathematics degrees as a percent of all masters degrees. In general, the number and percent of doctoral degrees in mathematics has remained constant since FY 1981. This indicates that Missouri is producing fewer graduates with advanced degrees in mathematics.

Mathematics Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	206	236	229	216	228	223
Bachelors - Percent of All Degrees	0.97%	0.91%	0.85%	0.78%	0.82%	0.78%
Masters - Number	88	54	39	45	52	40
Masters - Percent of All Degrees	1.21%	0.51%	0.36%	0.40%	0.43%	0.32%
Doctoral - Number	15	17	23	18	16	18
Doctoral - Percent of All Degrees	2.73%	2.47%	3.16%	2.31%	2.37%	2.48%

Source: MO Department of Higher Education.



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In FY 2000, a total of 550 post secondary degrees in the physical sciences were conferred in Missouri, of which 72.0% were bachelors degrees, 17.6% were masters degrees and 10.4% were doctoral degrees. The number of bachelors degrees in the physical sciences has decreased since FY 1981, as has physical science degrees as a percent of all bachelors degrees. This indicates that both numerically and proportionately fewer graduates are obtaining bachelors degrees in the physical sciences in Missouri.

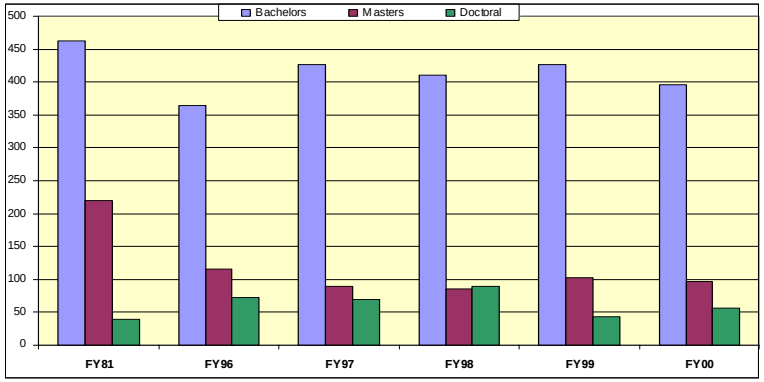
Since FY 1981, the number of masters degrees in the physical sciences has decreased, as has physical science degrees as a percent of all masters degrees. In addition, the number and percent of doctoral degrees in the physical sciences has declined since FY 1996, although the current figures are higher than in FY 1981. This indicates that Missouri is producing fewer graduates with advanced degrees in the physical sciences.

Physical Sciences Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	463	364	427	410	427	396
Bachelors - Percent of All Degrees	2.19%	1.40%	1.59%	1.48%	1.54%	1.38%
Masters - Number	220	115	90	85	102	97
Masters - Percent of All Degrees	3.03%	1.09%	0.83%	0.75%	0.84%	0.78%
Doctoral - Number	39	72	69	89	43	57
Doctoral - Percent of All Degrees	7.10%	10.45%	9.49%	11.42%	6.36%	7.85%

Source: MO Department of Higher Education.



In FY 2000, a total of 1,456 post secondary degrees in the life sciences were conferred in Missouri, of which 84.9% were bachelors degrees, 7.6% were masters degrees and 7.5% were doctoral degrees. The number of bachelors degrees in the life sciences has increased since FY 1981, however, life science degrees as a percent of all bachelors degrees has declined over the same period. This indicates that while numerically more graduates are obtaining bachelors degrees in the life sciences in Missouri, they represent a declining percent of all bachelors degrees conferred.

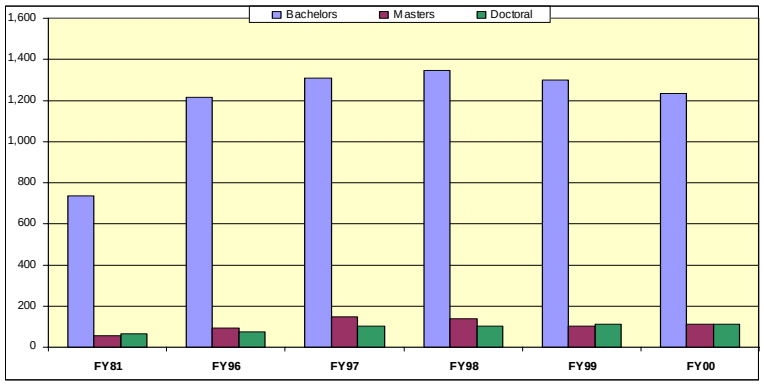
Since FY 1981, the number of masters degrees in the life sciences has increased, however, life science degrees as a percent of all masters degrees has declined. In addition, the number of doctoral degrees in the life sciences has increased since FY 1981, although the percentage of life sciences doctorates has declined since FY1996. This indicates that although Missouri is producing more graduates with advanced degrees in the life sciences, it remains proportionately small.

Life Sciences Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	736	1,216	1,309	1,344	1,299	1,236
Bachelors - Percent of All Degrees	2.06%	1.87%	1.81%	1.74%	1.88%	1.76%
Masters - Number	54	92	148	141	100	111
Masters - Percent of All Degrees	0.65%	0.33%	0.32%	0.37%	0.28%	0.26%
Doctoral - Number	67	73	104	103	109	109
Doctoral - Percent of All Degrees	0.36%	0.73%	0.83%	0.39%	0.89%	0.55%

Source: MO Department of Higher Education.



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In FY 2000, a total of 1,691 post secondary degrees in engineering were conferred in Missouri, of which 69.3% were bachelors degrees, 26.4% were masters degrees and 4.3% were doctoral degrees. The number of bachelors degrees in engineering has decreased since FY 1981, as has engineering degrees as a percent of all bachelors degrees. This indicates that both numerically and proportionately fewer graduates are obtaining bachelors degrees in engineering in Missouri.

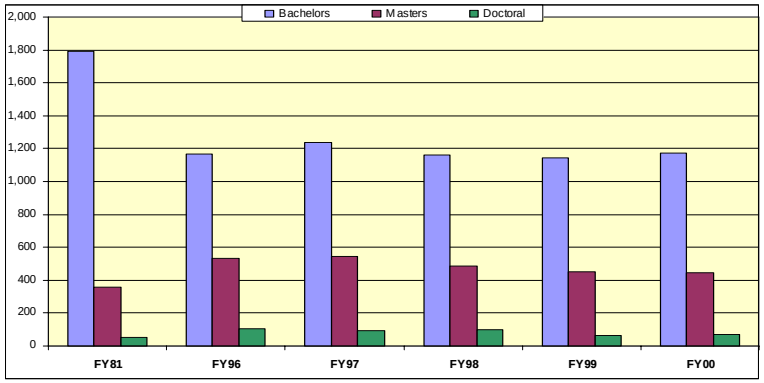
Since FY 1981, the number of masters degrees in engineering has increased, although there has been a decline since FY 1996. Additionally, engineering degrees as a percent of all masters degrees has also declined since FY 1981. In addition, the number and percent of doctoral degrees in engineering has declined since FY 1996, although the current figures are higher than in FY 1981. This indicates that Missouri is producing fewer graduates with advanced degrees in engineering.

Engineering Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	1,791	1,168	1,236	1,161	1,142	1,172
Bachelors - Percent of All Degrees	8.47%	4.49%	4.59%	4.20%	4.12%	4.09%
Masters - Number	357	534	545	488	451	447
Masters - Percent of All Degrees	4.92%	5.08%	5.02%	4.28%	3.72%	3.58%
Doctoral - Number	50	105	94	96	62	72
Doctoral - Percent of All Degrees	9.11%	15.24%	12.93%	12.32%	9.17%	9.92%

Source: MO Department of Higher Education.



In FY 2000, a total of 1,165 post secondary degrees in computer science were conferred in Missouri, of which 85.6% were bachelors degrees, 13.6% were masters degrees and 0.8% were doctoral degrees. The number of bachelors degrees in computer science has increased since FY 1981, as has computer science degrees as a percent of all bachelors degrees. This indicates that both numerically and proportionately more graduates are obtaining bachelors degrees in computer science in Missouri.

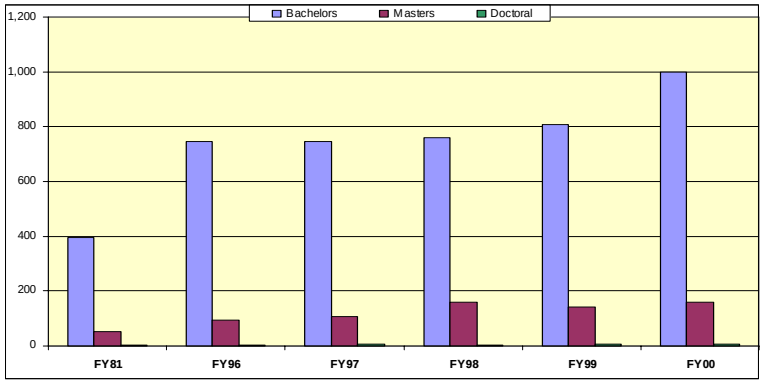
Since FY 1981, the number of masters degrees in computer science has increased, as has the computer science degrees as a percent of all masters degrees. In addition, the number and percent of doctoral degrees in computer science has grown since FY 1996, although the base numbers are quite small. This indicates that Missouri is producing more graduates with advanced degrees in computer science.

Computer Science Degrees Conferred by Higher Education Institutions in Missouri

Includes public and private higher education institutions.

DEGREE	FY81	FY96	FY97	FY98	FY99	FY00
Bachelors - Number	396	745	744	758	809	998
Bachelors - Percent of All Degrees	1.87%	2.86%	2.76%	2.74%	2.92%	3.48%
Masters - Number	53	92	109	160	142	159
Masters - Percent of All Degrees	0.73%	0.87%	1.00%	1.40%	1.17%	1.27%
Doctoral - Number	3	4	6	5	6	8
Doctoral - Percent of All Degrees	0.55%	0.58%	0.83%	0.64%	0.89%	1.10%

Source: MO Department of Higher Education.



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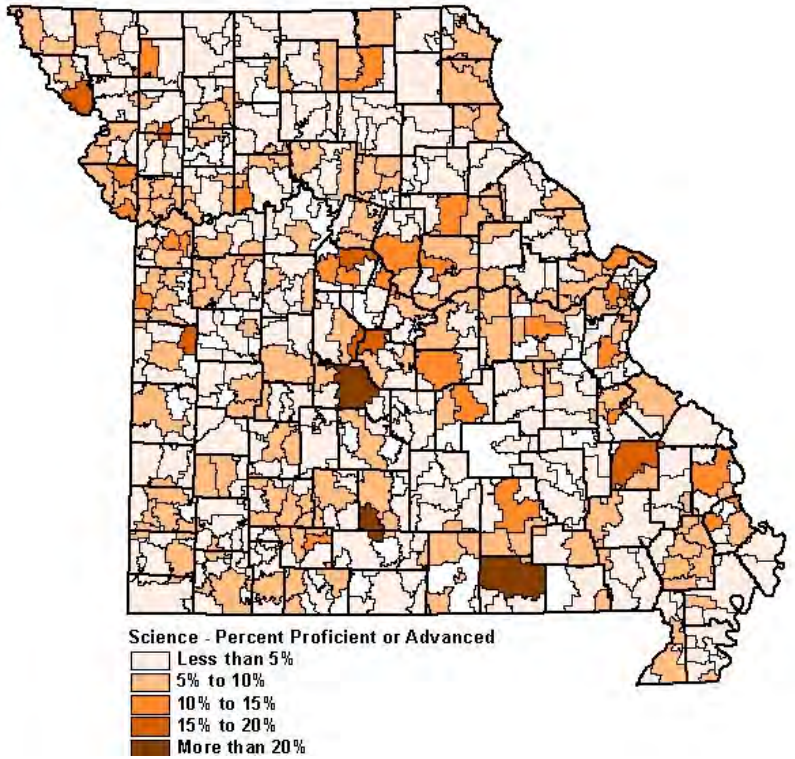
On average between 1997 and 2001, only 5.07% of Missouri's 10th graders were proficient or advanced in science. Districts with the highest proficiencies were located in pockets of south central, northwest and suburban Missouri. In short, the majority of the state's districts scored low on science proficiency.

These findings indicate that Missouri's K-12 student population is ill prepared for post secondary study in science-related subjects, and ill prepared to enter the workforce immediately after high school into occupations that require science skills.

Science - Missouri Assessment Program
Average Percent of 10th Grade Students Scoring Proficient or Advanced, 1997-2001



Source: Analysis of MO Department of Elementary and Secondary data by MERIC, MO Department of Economic Development.

IV. Missouri's Top Mathematics-Intensive Occupations

Computer Software Engineers

The explosive impact of computers and information technology on our everyday lives has generated a need to design and develop new computer software systems and to incorporate new technologies in a rapidly growing range of applications. Computer software engineers analyze users' needs and design, create and modify general computer applications software or specialized utility programs. Different programming languages are used, depending on the purpose of the program. Some software engineers develop both packaged systems and systems software or create customized applications.

Most employers prefer to hire persons who have at least a bachelor's degree and broad knowledge and experience with computer systems and technologies. Graduate degrees are preferred for some of the more complex jobs. Computer software engineers must continually strive to acquire new skills as computer technology changes rapidly. As technological advances in the computer field continue, employers demand new skills. Computer software engineers must continually strive to acquire new skills if they wish to remain in this extremely dynamic field. To help them keep up with the changing technology, continuing education and professional development seminars are offered by employers and software vendors, colleges and universities, private training institutions, and professional computing societies.

Computer software engineers are projected to be the fastest growing occupation over the 2000-2010 period. Very favorable opportunities are expected for college graduates with at least a bachelor's degree in computer engineering or computer science and practical experience working with computers.

A increasing number of computer software engineers are employed on a temporary or contract basis - many of whom are self-employed that work independently as consultants. Some consultants work for firms that specialize in developing and maintaining client companies' websites and intranets. Consulting opportunities for software engineers should grow as businesses need help managing, upgrading and customizing increasingly complex computer systems. Nationally, about 49,000 computer software and systems engineers were self-employed in 2000.

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According to 2000 estimates, there were 5,950 Computer Software Engineers in Missouri earning an annual mean wage of $65,182 per job, below the national average of $70,300 per job. On average in Missouri, entry-level wages were $47,749 per job and experienced-level wages were $73,898 per job. Most were employed in Services (3,630 jobs earning $66,046 per job), Transportation and Public Utilities (1,270 jobs earning $66,438 per job) and Finance, Insurance and Real Estate (580 jobs earning $62,463 per job).

In 2000, Computer Software Engineers in Missouri represented 1.59% of all jobs in this occupation nationally, earning 92.72% of the national mean annual wage. In the United States, employment for Computer Software Engineers is expected to grow by an astounding 100.0% between 2000 and 2010.

Computer Software Engineers
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	0	0	0	0
Construction	10	$39,584	$61,184	$71,984
Manufacturing	350	$41,159	$55,143	$62,135
Transportation and Public Utilities	1,270	$53,451	$66,438	$72,932
Wholesale Trade	80	$48,153	$68,783	$79,098
Retail Trade	10	$39,584	$78,800	$98,407
Finance, Insurance, and Real Estate	580	$42,389	$62,463	$72,500
Services	3,630	$48,426	$66,046	$74,856
Public Administration	10	$48,523	$57,236	$61,592
MISSOURI TOTAL	**5,950**	**$47,749**	**$65,182**	**$73,898**
UNITED STATES TOTAL	**374,640**	**$53,390**	**$70,300**	**$85,490**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

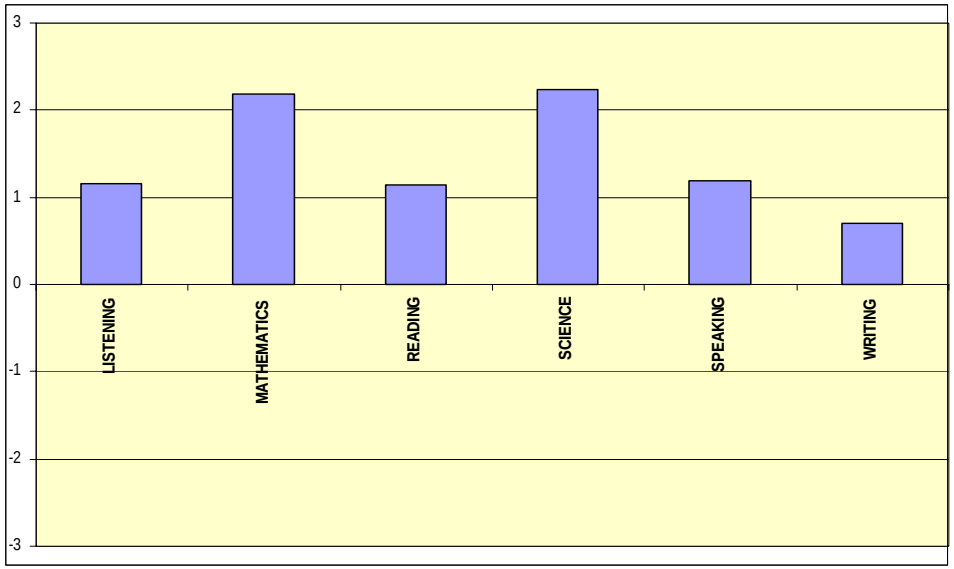
Computer Software Engineers require high proficiency in science and mathematics skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in speaking, listening and reading skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in science and mathematics - is essential for success as a Computer Software Engineer.

Computer Software Engineers
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
1.1553	2.1833	1.1485	2.2375	1.1870	0.7056

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



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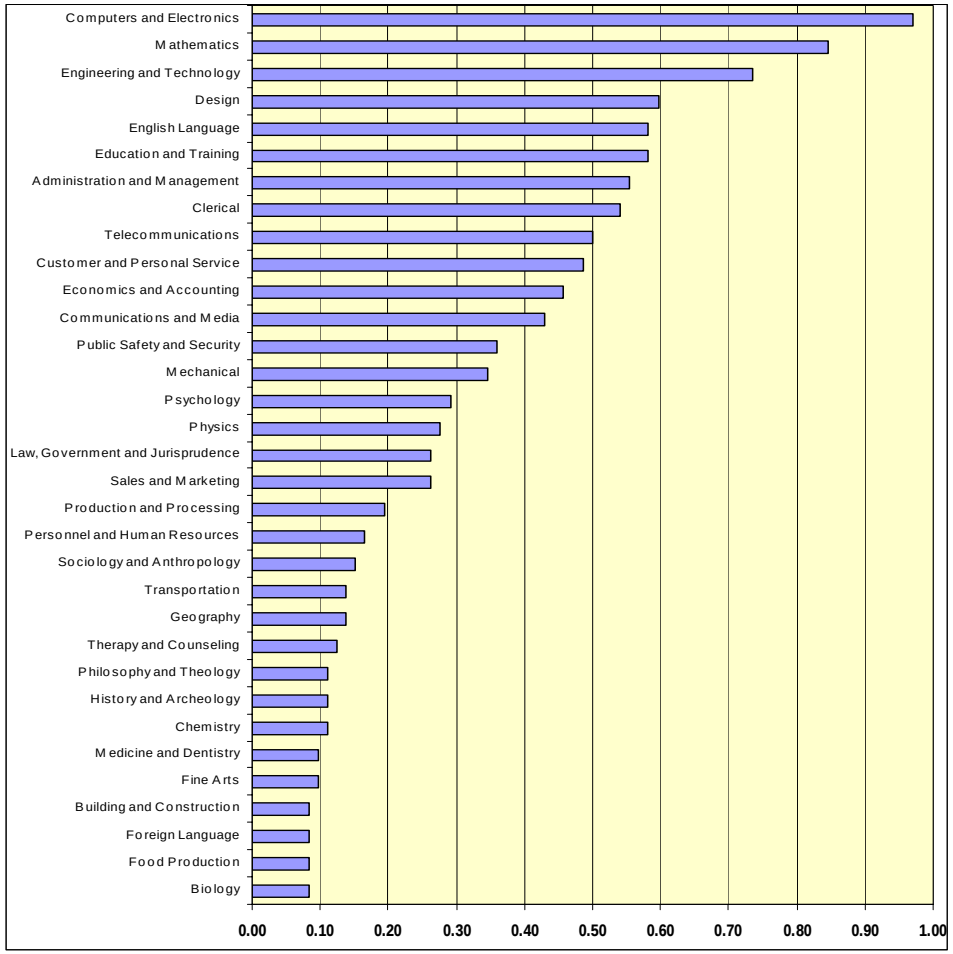
Computers and Electronics (proficiency score of 0.97), Mathematics (proficiency score of 0.85) and Engineering and Technology (proficiency score of 0.74) are the most important knowledge domains needed for Computer Software Engineers.

Computer Software Engineers
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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Computer Systems Engineers

The explosive impact of computers and information technology on our everyday lives has generated a need to design and develop new computer systems and to incorporate new technologies in a rapidly growing range of applications. Computer systems engineers coordinate the construction and maintenance of a company's computer systems, and plan their future growth. They coordinate each department's computer needs and make suggestions about its technical direction. They also might set up the company's intranets, which are networks that link computers within the organization and ease communication.

Most employers prefer to hire persons who have at least a bachelor's degree and broad knowledge and experience with computer systems and technologies. Graduate degrees are preferred for some of the more complex jobs. Computer systems engineers must continually strive to acquire new skills as computer technology changes rapidly. As technological advances in the computer field continue, employers demand new skills. Computer systems engineers must continually strive to acquire new skills if they wish to remain in this extremely dynamic field. To help them keep up with the changing technology, continuing education and professional development seminars are offered by employers and software vendors, colleges and universities, private training institutions, and professional computing societies.

Computer systems engineers are projected to be the fastest growing occupation over the 2000-2010 period. Very favorable opportunities are expected for college graduates with at least a bachelor's degree in computer engineering or computer science and practical experience working with computers.

A increasing number of computer systems engineers are employed on a temporary or contract basis - many of whom are self-employed, that work independently as consultants. Some consultants work for firms that specialize in developing and maintaining client companies' websites and intranets. Consulting opportunities for systems engineers should grow as businesses need help managing, upgrading and customizing increasingly complex computer systems. Nationally, about 49,000 computer software and systems engineers were self-employed in 2000.

According to 2000 estimates, there were 3,700 Computer Systems Engineers in Missouri earning an annual mean wage of $64,743 per job, well below the national average of $70,890 per job. On average in Missouri, entry-level wages were $44,464 per job and experienced-level wages were $74,882 per job. Most were employed in Services (2,140 jobs earning $66,281 per job), Manufacturing (930 jobs earning $61,533 per job) and Finance, Insurance and Real Estate (440 jobs earning $61,552 per job).

In 2000, Computer Systems Engineers in Missouri represented 1.40% of all jobs in this occupation nationally, earning 91.33% of the national mean annual wage. In the United States, employment for Computer Systems Engineers is expected to grow by 89.7% between 2000 and 2010.

Computer Systems Engineers
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	0	0	0	0
Construction	0	0	0	0
Manufacturing	930	$48,114	$61,533	$68,243
Transportation and Public Utilities	120	$56,065	$69,170	$75,722
Wholesale Trade	40	$48,102	$71,211	$82,765
Retail Trade	30	$44,318	$75,848	$91,613
Finance, Insurance, and Real Estate	440	$46,163	$61,552	$69,247
Services	2,140	$42,298	$66,281	$78,273
Public Administration	0	0	0	0
MISSOURI TOTAL	**3,700**	**$44,464**	**$64,743**	**$74,882**
UNITED STATES TOTAL	**264,610**	**$54,460**	**$70,890**	**$86,520**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

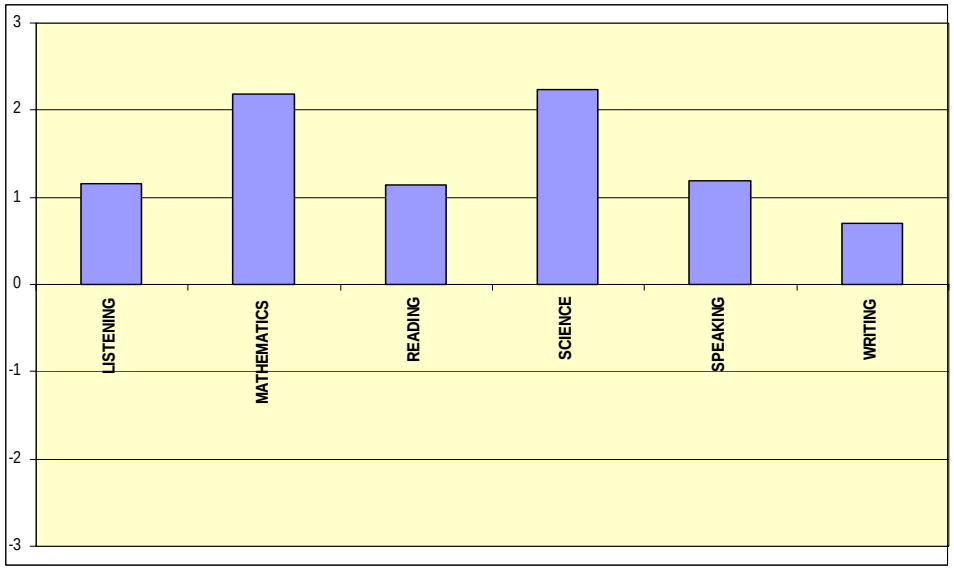
Computer Systems Engineers require high proficiency in science and mathematics skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in speaking, listening and reading skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in science and mathematics - is essential for success as a Computer Systems Engineer.

Computer Systems Engineers
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
1.1553	2.1833	1.1485	2.2375	1.1870	0.7056

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



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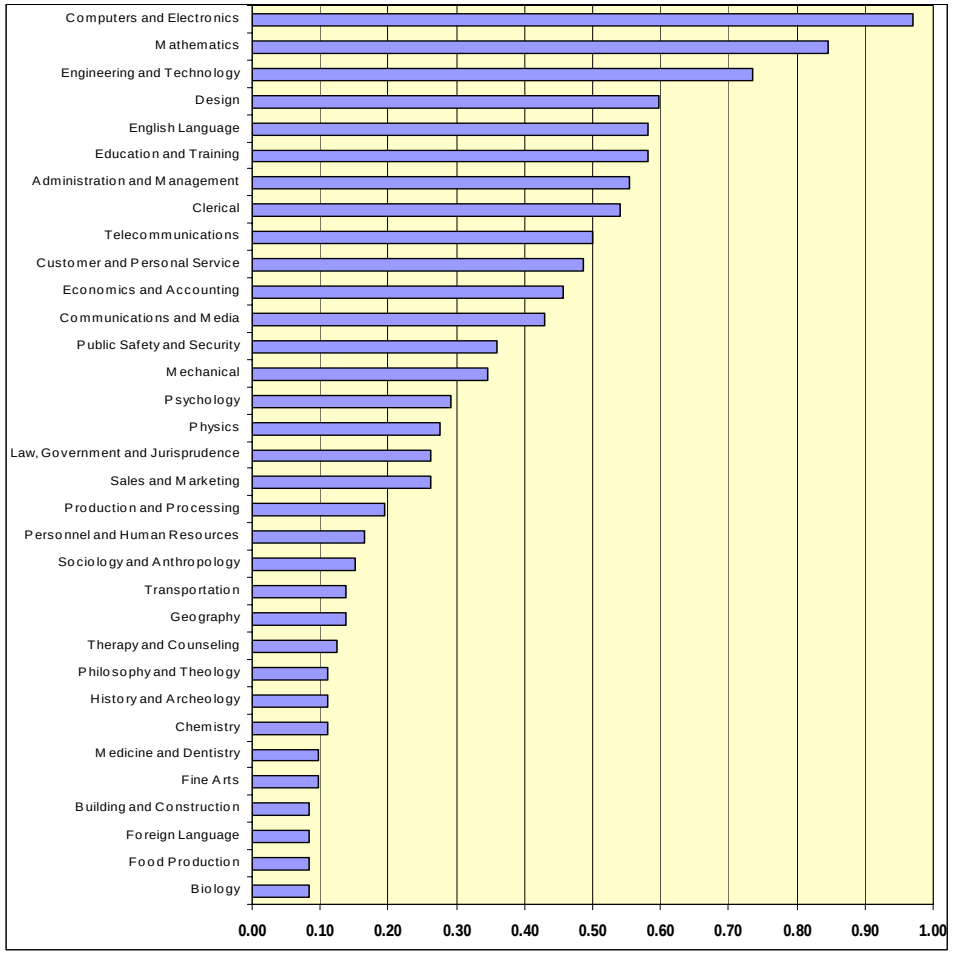
Computers and Electronics (proficiency score of 0.97), Mathematics (proficiency score of 0.85) and Engineering and Technology (proficiency score of 0.74) are the most important knowledge domains needed for Computer Systems Engineers.

Computer Systems Engineers
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

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Engineering Managers

Engineering managers supervise people who design and develop machinery, products, systems, and processes; or direct and coordinate production, operations, quality assurance, testing, or maintenance in industrial plants. Many are plant engineers, who direct and coordinate the design, installation, operation, and maintenance of equipment and machinery in industrial plants. Others manage research and development teams that produce new products and processes or improve existing ones.

Strong technical knowledge is essential for engineering managers, who must understand and guide the work of their subordinates and explain the work in nontechnical terms to senior management and potential customers. Therefore, these management positions usually require work experience and formal education similar to that of engineers, scientists, or mathematicians. To perform effectively, they also must possess knowledge of administrative procedures, such as budgeting, hiring, and supervision. These managers propose budgets for projects and programs and determine staff, training, and equipment purchases. They hire and assign scientists, engineers, and support personnel to carry out specific parts of each project. They also supervise the work of these employees, review their output, and establish administrative procedures and policies - including environmental standards.

Most engineering managers begin their careers as engineers, after completing a bachelor's degree in the field. To advance to higher level positions, engineers generally must assume management responsibility. To fill management positions, employers seek engineers who possess administrative and communications skills in addition to technical knowledge in their specialty. Many engineers gain these skills by obtaining a master's degree in engineering management or a master's degree in business administration (MBA). Employers often pay for such training. In large firms, some courses required in these degree programs may be offered onsite. Engineers who prefer to manage in technical areas should get a master's degree in engineering management, while those interested in nontechnical management should get an MBA.

Employment of engineering managers is expected to increase more slowly than the average for all occupations through the year 2010 - in line with projected employment growth in engineering and most sciences. However, many additional jobs will result from the need to replace managers who retire or move into other occupations. Opportunities for obtaining a management position will be best for workers with advanced technical knowledge and strong communication and administrative skills.

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According to 2000 estimates, there were 4,600 Engineering Managers in Missouri earning an annual mean wage of $75,615 per job, less than the national average of $85,450 per job. On average in Missouri, entry-level wages were $60,312 per job and experienced-level wages were $90,611 per job. Most Engineering Managers were employed in Manufacturing (2,160 jobs earning $77,121 per job), Services (1,360 jobs earning $72,208 per job) and Transport and Public Utilities (610 jobs earning $79,892 per job).

In 2000, Engineering Managers in Missouri represented 1.89% of all jobs in this occupation nationally, earning 88.49% of the national mean annual wage. In the United States, employment for Civil Engineers is expected to grow by 8.0% between 2000 and 2010.

Engineering Managers
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	10	$48,027	$70,748	$83,761
Construction	90	$57,867	$72,533	$85,303
Manufacturing	2,160	$60,921	$77,121	$92,911
Transportation and Public Utilities	610	$65,815	$79,892	$92,078
Wholesale Trade	100	$53,830	$69,202	$83,814
Retail Trade	20	$59,367	$74,601	$91,981
Finance, Insurance, and Real Estate	20	$75,816	$76,906	$88,158
Services	1,360	$52,981	$72,208	$88,709
Public Administration	240	$62,758	$74,466	$88,622
MISSOURI TOTAL	**4,600**	**$60,312**	**$75,615**	**$90,611**
UNITED STATES TOTAL	**242,280**	**$66,420**	**$85,450**	**$105,630**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

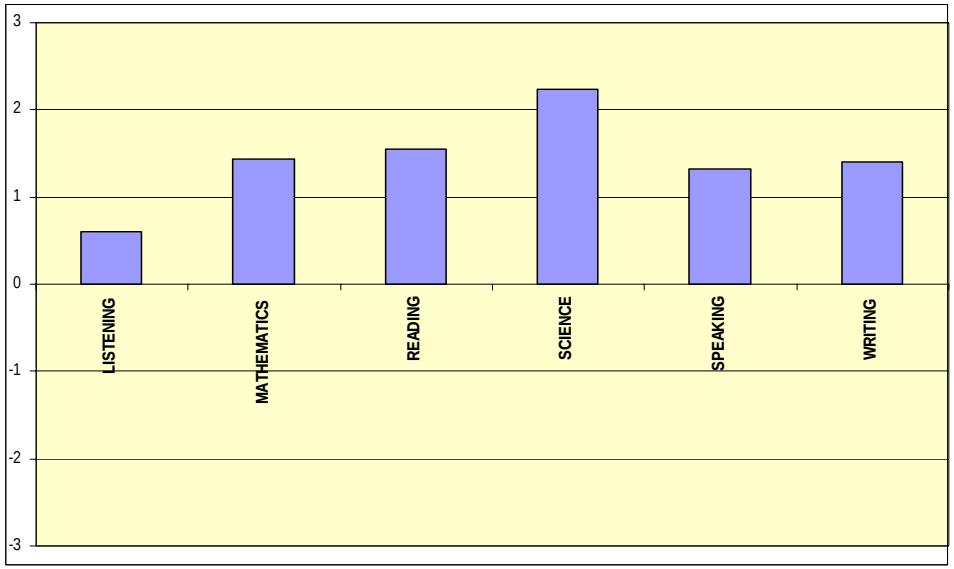
Engineering Managers require high proficiency in science skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in reading, mathematics, writing and speaking skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in science - is essential for success as an Engineering Manager.

Engineering Managers
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

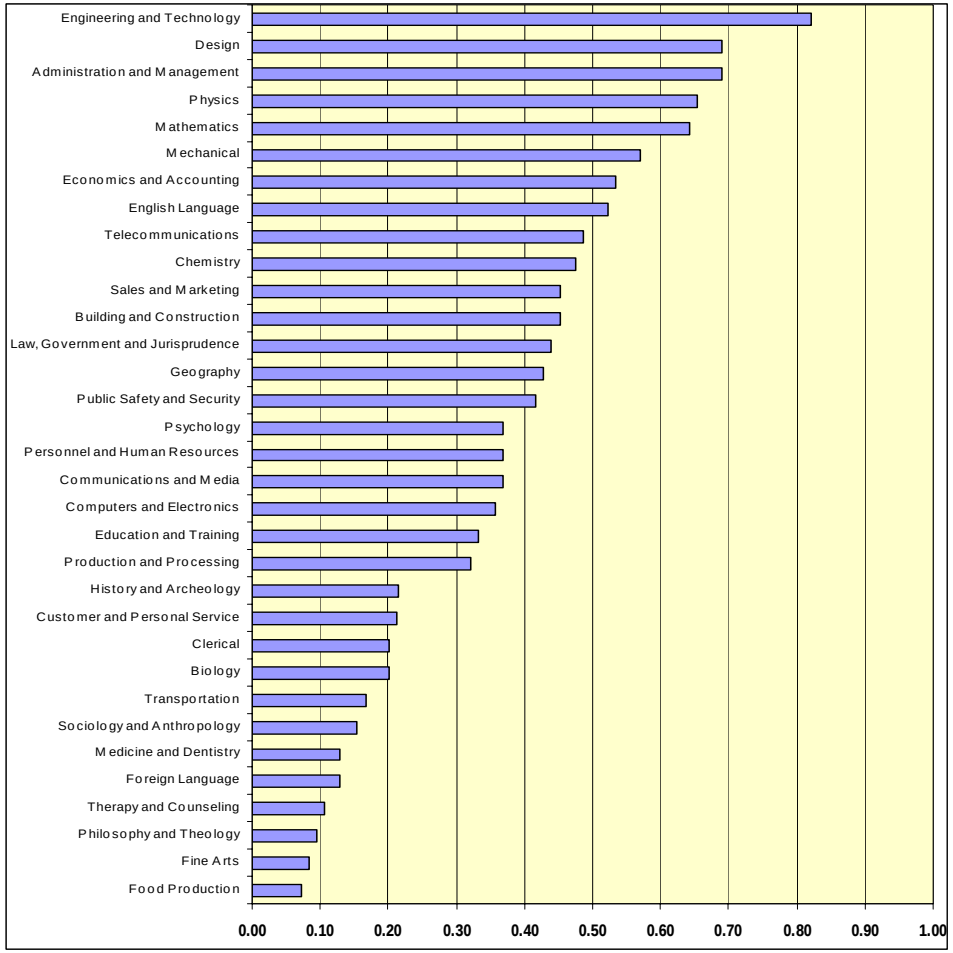
LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
0.6068	1.4370	1.5412	2.2375	1.3236	1.4079

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



Engineering and Technology (proficiency score of 0.82) is the most important knowledge domain needed for Engineering Managers.

Engineering Managers
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

Pharmacists

Pharmacists dispense drugs prescribed by physicians and other health practitioners and provide information to patients about medications and their use. They advise physicians and other health practitioners on the selection, dosages, interactions, and side effects of medications. Pharmacists must understand the use, clinical effects and composition of drugs - including their chemical, biological and physical properties. Compounding - the actual mixing of ingredients to form powders, tablets, capsules, ointments and solutions - is only a small part of a pharmacist's practice, because most medicines are produced by pharmaceutical companies in a standard dosage and drug delivery form. Most pharmacists work either in a community setting, such as a retail drug store, or in a hospital or clinic.

Pharmacists in community or retail pharmacies counsel patients and answer questions about prescription drugs, such as those about possible adverse reactions or interactions. They provide information about over-the-counter drugs and make recommendations after asking a series of health questions, such as whether the customer is taking any other medications. Pharmacists in hospitals and clinics dispense medications and advise the medical staff on the selection and effects of drugs. They may make sterile solutions and buy medical supplies. They also assess, plan, and monitor drug programs or regimens. They counsel patients on the use of drugs while in the hospital, and on their use at home when the patients are discharged. Pharmacists also may evaluate drug use patterns and outcomes for patients in hospitals or managed care organizations.

A license to practice pharmacy is required in all states, the District of Columbia and U.S. territories. To obtain a license, one must serve an internship under a licensed pharmacist, graduate from an accredited college of pharmacy, and pass a state examination. All states, except California and Florida, currently grant a license without extensive re-examination to qualified pharmacists already licensed by another state. However, one should check with state boards of pharmacy for details. Many pharmacists are licensed to practice in more than one state. States may require continuing education for license renewal. In 2000, 82 colleges of pharmacy were accredited to confer degrees by the American Council on Pharmaceutical Education. Pharmacy programs grant the degree of Doctor of Pharmacy (Pharm.D.), which requires at least 6 years of postsecondary study and the passing of the licensure examination of a state board of pharmacy. This degree has replaced the Bachelor of Science (B.S.) degree, which will cease to be awarded after 2005. The Pharm.D. is a 4-year program that requires at least 2 years of college study prior to admittance. Entry requirements usually include mathematics and natural sciences, such as chemistry, biology, and physics, as well as courses in the humanities and social sciences. Some colleges require the applicant to take the Pharmacy College Admissions Test.

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According to 2000 estimates, there were 4,600 Pharmacists in Missouri earning an annual mean wage of $66,836 per job, slightly less than the national average of $69,440 per job. On average in Missouri, entry-level wages were $60,963 per job and experienced-level wages were $78,275 per job. Most Pharmacists were employed in Retail Trade (3,050 jobs earning $67,378 per job) and Services (1,330 jobs earning $66,054 per job).

In 2000, Pharmacists in Missouri represented 2.16% of all jobs in this occupation nationally, earning 96.25% of the national mean annual wage. In the United States, employment for Pharmacists is expected to grow by 24.3% between 2000 and 2010.

Pharmacists
Employment and Wages by Industry in Missouri
Estimated annual average employment and wages for 2000. Numbers may not total due to rounding and survey averages.

INDUSTRY	AVERAGE EMPLOYMENT	ENTRY WAGE	MEAN WAGE	EXPERT WAGE
Agriculture, Forestry and Fishing	0	0	0	0
Mining	0	0	0	0
Construction	0	0	0	0
Manufacturing	10	$43,333	$60,391	$71,729
Transportation and Public Utilities	0	0	0	0
Wholesale Trade	90	$61,472	$67,048	$71,406
Retail Trade	3,050	$61,418	$67,378	$80,097
Finance, Insurance, and Real Estate	0	0	0	0
Services	1,330	$60,368	$66,054	$74,736
Public Administration	120	$59,012	$62,086	$68,630
MISSOURI TOTAL	**4,600**	**$60,963**	**$66,836**	**$78,275**
UNITED STATES TOTAL	**212,660**	**$61,860**	**$69,440**	**$81,690**

Source: Analysis of Occupational Employment Statistics and O*NET by MERIC, MO Department of Economic Development.

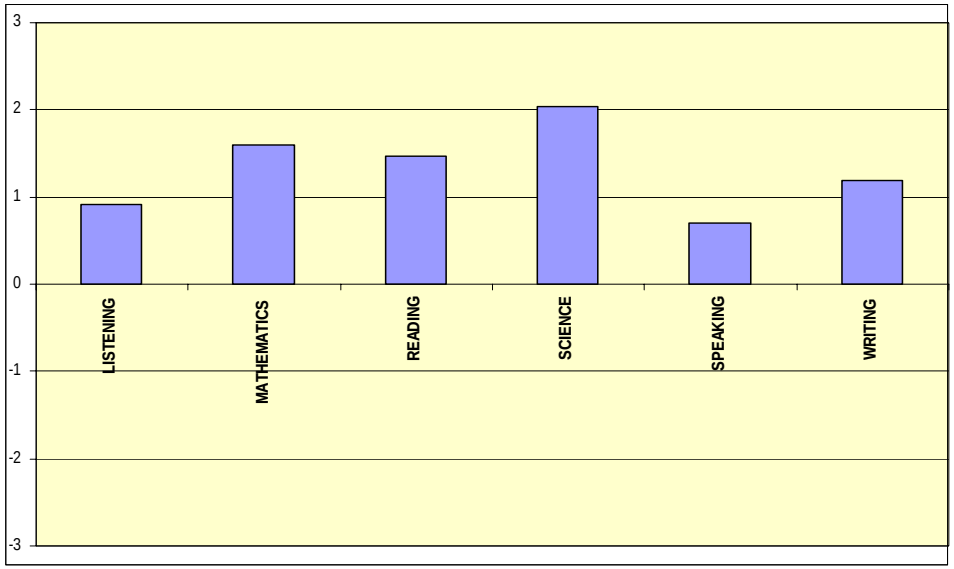
Pharmacists require high proficiency in science skills (2.0 or more standard deviations above the mean). In addition, above average proficiency in mathematics, reading and writing skills are generally needed for this occupation (1.0 or more standard deviation above the mean). This indicates that above average abilities in a wide array of skills - with specialization in science - is essential for success as a Pharmacist.

Pharmacists
Skills Proficiency

Skills reported in standard deviations above the mean for all occupations.
Scores of 0.0 indicate mean skill level for all occupations.

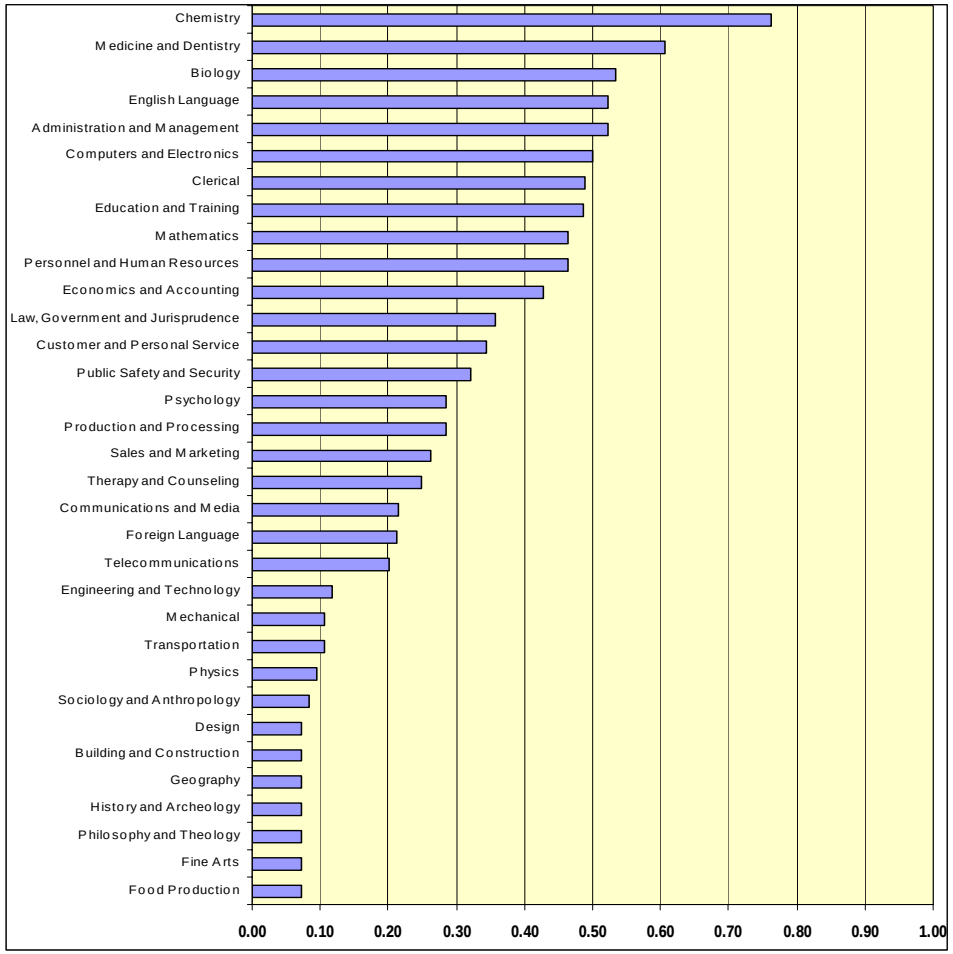
LISTENING SKILLS	MATHEMATICS SKILLS	READING SKILLS	SCIENCE SKILLS	SPEAKING SKILLS	WRITING SKILLS
0.9209	1.6012	1.4617	2.0426	0.7067	1.1934

Source: Analysis of O*NET by MERIC, MO Department of Economic Development.



Chemistry (proficiency score of 0.76) is the most important knowledge domain needed for Pharmacists.

Pharmacists
Knowledge Domain Proficiency
Skills proficiency reported on a 0.0 (low) to 1.0 (high) scale.



Source: Analysis of O*NET by MERIC, MO Department of Economic Development.

V. Implications and Summary

Science is one of the key knowledge bases in today's economy. Therefore, this analysis focuses on those occupations that require a high degree of knowledge in science - a targeted Gateway Skill. According to 2000 estimates, there were 53,350 science-intensive jobs in Missouri earning an annual mean wage of $67,254 per job, which is much higher than the state average wage of $30,812 per job. Nationally, there were 2.89 million science-intensive jobs earning an annual mean wage of $70,794 per job. Missouri employs 1.85% of this national total at 95.0% of the national mean annual wage, indicating lower labor costs for science-intensive jobs.

In Missouri, most science-intensive jobs were in Services, Manufacturing, Transport and Public, Retail Trade and Public Administration. Science-intensive occupations with the highest employment base were Computer Software Engineers, Engineering Managers, Pharmacists, Computer Systems Engineers and Medical Laboratory Technologists.

Occupations with the largest percentage of national employment in Missouri were Obstetricians and Gynecologists (5.32% of national employment at 105.41% of national mean wages), Agricultural Engineers (5.07% of national employment at 97.04% of national mean wages) and Aerospace Engineers (4.65% of national employment at 81.43% of national mean wages. These occupations can be considered target occupations, since Missouri has a fair share of national employment and state wage rates are at or below the national mean annual wage - indicating lower labor costs, a possible competitive advantage.

The most important knowledge domain needed for science-intensive occupations were Mathematics, English Language and Chemistry. Although Missouri institutions of higher education are producing more graduates in many of these fields of study than they did 20 years ago, the proportion of these degrees relative of all degrees conferred is declining. More worrisome, however, is that only 5.07% of Missouri's 10th graders were proficient or advanced in science. These findings indicate that Missouri's K-12 student population is ill prepared for post secondary study in science-related subjects, and ill prepared to enter the workforce immediately after high school into occupations that require science skills.

In conclusion, science-intensive occupations are an important part of Missouri's growing economy. Development of these occupations will be essential for Missouri to remain competitive in the global economy of the 21st century. To achieve this, both private and public partners need to strengthen science-intensive occupations through business development, improved K-12 science education and expanded higher education programs in mathematics and science.

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